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# NEW TAXA AND NEW COMBINATIONS IN THE GENUS *CRASSULA*

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## ABSTRACT

84 new taxa and new combinations are proposed. Keys are provided to some species complexes.

## UITTREKSEL

NUWE TAKSA EN KOMBINASIES IN DIE GENUS *CRASSULA*

84 nuwe taksa en nuwe kombinasies word voorgestel. Sleutels vir enige spesies komplekse is ingesluit.

The need for accepted names in several publications has prompted the author to validate new combinations and to describe new taxa before the complete taxonomic revision of the genus *Crassula* in Southern Africa appears in print. Author abbreviations as recommended for the *Flora of Southern Africa* are adopted, so that 'Schonl.' is used here for Schönland.

1. **Crassula alba** Forsk. var. **parvisepala** (Schonl.) Toelken, comb. nov.
*C. rubicunda* var. *parvisepala* Schonl. in Trans. Roy. Soc. S. Afr. **17:** 231 (1929). Type: Transvaal, Lydenburg, *Wilms 538* (GRA, lecto!; BM!; E!; G!; P!; Z!).

Although the flowers of this species are usually red in South Africa they do not differ morphologically from those of *C. alba* from northern Africa. *Wilms 538* is chosen as lectotype from the three syntypes, as it is well represented in many herbaria.

2. **Crassula alpestris** Thunb. subsp. **massonii** (Britt. & Bak. f.) Toelken, comb. nov. et stat. nov.
*C. massonii* Britt. & Bak. f. in J. Bot., Lond. **35:** 485 (1897). Type: Promontorium Bonae Spei, *Masson s.n.* (BM, holo!; PRE, photo!).

This subspecies, which occurs in two widely separated localities, seems to hybridize with the typical subspecies wherever the two taxa occur in proximity to one another. The subsp. *alpestris* usually has a terminal thyrsoid inflorescence while the subsp. *massonii* has terminal and lateral cymules.

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3. **Crassula ammophila** Toelken, sp. nov. ab *C. subaphylla* pilis adpressis foliorum usque ad 1 mm longis et marginibus apicum petalorum non recurvis differt.

Frutices perennes caulibus fragilibus erectis usque ad 80 cm longis et juvenibus rare latioribus 0,2 cm in diametro, paucis ramosis, foliis veteribus caducis. *Folia* oblongo-lanceolates, 0,8–1,5 cm longa, 0,3–0,4 cm lata, obtusa vel acuta, plana vel leviter convexa supra, covexissima subtus, dense tecta pilis recurvis adpressis, cano-viridia vel cano-fusca; vaginae foliorum usque ad 1 mm longae. *Hydathodi* dispersi supra et subtus, inconspicui. *Inflorescentia* thyrsus terminalis oblongatus vel globosus, 1–3 dichasiis caulibus plus minusve longis, floribus sessilibus pentameris, pedunculo 1–3 cm longo et pilis recurvis adpressis, bracteis triangularibus in dichasiis. *Sepala* triangularia, 2–2,5 mm longa, obtusa vel acuta, dense tecta pilis expansis et ciliis marginalibus saepe indistinctis, succulenta cano-viridia. *Petala* panduriformia, 3–3,5 mm longa, apicibus acuminatis canaliculatis et cristis dorsalibus ad apices, 0,3–0,6 mm connata, apicibus laborum vix recurvis, eburnea. *Stamina* c. 2 mm longa, antheris nigris 0,7–0,9 mm longis, filamentis leviter latescentibus ad bases et aliquantum constrictis ubicumque connatis tubo petalorum. *Squamae* oblongae, 0,7–0,8 × 0,2–0,4 mm, leviter emarginatae, vix constrictae ad basim, parum succulentae, luteae. *Carpella* ovariis reniformibus constrictibus ad stigmates laterales rubra; ovarium 10–16 ovulis elongatis et papillis inconspicuis serialibus.

*Type:* Cape, Nuwerus, *Pearson 5501* (GRA, holo!; K!).

Perennials with brittle erect branches up to 80 cm long, often scrambling or rarely decumbent shrublets and with young branches rarely more than 0,2 cm in diameter and with peeling bark towards the base, little branched and with old leaves deciduous. *Leaves* sessile, oblong-lanceolate, 0,8–1,5 cm long, 0,3–0,4 cm broad, with bluntly acute or rounded apices, flat or slightly convex above and very much convex below and almost as thick as broad, densely covered with recurved adpressed hairs, grey-green to greyish-brown; sheath up to 0,1 cm long and formed by the partial fusion of the leaf bases. *Hydathodes* scattered mainly over the upper but also on the lower surface, indistinct. *Inflorescence* a terminal elongated to rounded or globular thyrse with one to three dichasia more or less stalked, with sessile 5-merous flowers, with a peduncle hardly distinct from a vegetative branch and 1–3 cm long and with adpressed hairs, with triangular bracts with rounded apex rather like the sepals. *Sepals* triangular 2–2,5 mm long, bluntly acute covered with long erect hairs and with often indistinct marginal cilia, fleshy, green. *Petals* panduriform, 3–3,5 mm long, with acuminate canaliculate apices without dorsal ridges, fused into a tube 0,3–0,6 mm long, with apices of the lobes hardly recurved, cream. *Stamens* c. 2 mm long, with black anthers 0,7–0,9 mm long, with filaments slightly

broadened towards the base and somewhat constricted where fused to the petal tube. *Squamae* oblong 0,7–0,8 × 0,2–0,4 mm, slightly emarginate, hardly constricted towards the base, fleshy, yellow. *Carpels* with reniform ovaries gradually constricted towards the sessile and somewhat laterally placed red stigmas; ovary slightly papillose and with 10–16 elongate ovules covered with rows of inconspicuous papillae.

A scrambler among shrubs of the coastal sandveld vegetation from near Saldanha Bay to north of the Holgat River.

CAPE—2816 (Oranjemund): Holgat River (-DD), *Tölken 5270* (PRE).
—3017 (Hondeklipbaai): 18 km east of Hondeklipbaai (-AD), *Wisura 891* (NBG).
—3118 (Vanrhynsdorp): Nuwerus (-AB), *Pearson 5501* (BOL, K): near Koekenaap (-AD), *Tölken 5163* (PRE).
—3317 (Saldanha): Danger Point (-BB), *Hall* in NBG *126/53* (BOL, NBG).

4. **Crassula arborescens** (Mill.) Willd. subsp. **undulatifolia** Toelken, subsp. nov. ab subsp. *arboresenti* foliis ellipticis et undulatis differt.
Folia elliptica vel elliptico-oblanceolata, 0,8–1,5 (–2) cm lata, undulata, leviter succulenta et erecta.

*Type:* Cape, 1 km north of Sapkamma Station, *Tölken 4290* (BOL, holo!).

Leaves elliptic to elliptic-oblanceolate, 0,8–1,5 (–2) cm broad, undulate, slightly fleshy, erect.

On rocky slopes in sheltered kloofs in the southern parts of the Klein Winterhoek mountains.

This subspecies flowers in December and January as is typical for *C. arborescens*, while the very similar *C. ovata*, which occurs within a few kilometres of the type locality of the new subspecies, flowers during the period June to August.

CAPE—3325 (Port Elizabeth): 1 km north of Sapkamma Station (-AC), *Tölken 4290* (BOL); Paardepoort, near Glenconner Station (-AC), *Tölken 4299* (BOL).

5. **Crassula atropurpurea** (Haw.) Dietr., Syn. Pl. **2:** 1031 (1840). Iconotype: plate 780 (K, lecto!).
*Globulea atropurpurea* Haw. in Phil. Mag. **64:** 189 (1824); DC., Prodr. 3: 391 (1828).

This variable complex is viewed as one species with six divergent varieties, each of which occupies a somewhat different ecological niche but their ecological tolerances allow them to occur sufficiently close to one another with the result that extensive hybrid populations are found in some areas.

1 Leaves glabrous:

2 Lateral branches with internodes more or less equal in length; peduncle with (2) 3–5 bracts without part-inflorescences . . **C. atropurpurea** var. **atropurpurea**

*2* Lateral branches with first internodes much longer than subsequent ones; peduncle with (0) 1 (2) pairs of bracts without part-inflorescences . . . . . . . . . **C. atropurpurea** var. **cultriformis**

*1* Leaves hairy:

3 Leaves triangular to almost round in section . . **C. atropurpurea** var. **purcellii**

*3* Leaves dorsiventrally compressed:

4 Leaves with recurved marginal cilia . . **C. atropurpurea** var. **rubella**

*4* Leaves without marginal cilia or if present then spreading:

5 Petals with membranous apex curved downwards and with dorsal appendage in terminal position and more or less canaliculate . . . . . . . . . **C. atropurpurea** var. **anomala**

*5* Petals without membranous apex and with terminal canaliculate fleshy rostrum:

6 Lateral branches with first internodes much longer than subsequent ones; petals glabrous . . . . . **C. atropurpurea** var. **cultriformis**

*6* Lateral branches with internodes more or less equal in length; petals minutely papillose . . . . . . **C. atropurpurea** var. **watermeyeri**

—— var. **anomala** (Schonl. & Bak. f.) Toelken, comb. nov. et stat. nov.

*C. anomala* Schonl. & Bak. f. in J. Bot., Lond. **36:** 370 (1898); Schonl. in Trans. Roy. Soc. S. Afr. **17:** 263 (1929). Type: Cape, French Hoek, *Schlechter* 9317 (GRA, holo!; BM!; BOL!; E!; G!; K!; P!; Z!).

—— var. **cultriformis** (Friedr.) Toelken, comb. nov. et stat. nov.

*C. cultriformis* Friedr. in Mitt. Bot. Staatssamml. München **6:** 638, fig. 9A (1967) et in Prodr. Fl. S. W. Afr. **52:** 27 (1968). Type: Cape, Holgat River, *Herre 4088* (M, holo).

—— var. **purcellii** (Schonl.) Toelken, comb. nov. et stat. nov.

*C. purcellii* Schonl. in Rec. Albany Mus. **2:** 148 (1907) et in Trans. Roy. Soc. S. Afr. **17:** 266 (1929). Type: Cape, Matjesfontein, *Purcell s.n.* (GRA, holo!).

—— var. **rubella** (Compton), Toelken, comb. nov. et stat. nov.

*C. rubella* Compton in Trans. Roy. Soc. S. Afr. **19:** 291 (1931). Syntypes: Cape, Witteberg, *Compton 2820* (BOL!); Whitehill, *Compton 2892* (BOL!).

—— var. **watermeyeri** (Compton) Toelken, comb. nov. et stat. nov.

*C. watermeyeri* Compton in J. Bot., Lond. **69:** 49 (1931). Type: Cape, near Nieuwoudtville, *Compton 3208* (BOL, holo!).

6. **Crassula ausensis** P. C. Hutch. subsp. **giessii** (Friedr.) Toelken, comb. nov. et stat. nov.

*C. giessii* Friedr. in Mitt. Bot. Staatssamml. **11:** 330, fig. 5 (1974). Type: South West Africa, Naukluft, *Merxmüller & Giess 28 956* (M, holo). The very short pedicels and usually ciliate leaves distinguish this subspecies from the typical one.

7. **Crassula barbata** Thunb. subsp. **broomii** (Schonl.) Toelken, comb. nov. et stat. nov.
*C. broomii* Schonl. in Rec. Albany Mus. **2:** 146 (1907). Type: Cape, Pampoenpoort, *Broom s.n.* (GRA, holo!).
The leaves are broadly obovate and these have marginal cilia only up to 0,1 cm long. The very large lateral stigma and the more or less distinct style found in the type specimen are variable characters in this subspecies and seem to depend on the stage of maturity of the carpels.

8. **Crassula brachystachya** Toelken, sp. nov. ab *C. obovata* foliis acutis et brevibus qui abrupte abbreviatis ad basim inflorescentiae, floribus sessilibus et appendice brevi in petalo differt.
Suffrutices perennes plerumque aliquot rosulis foliis spiraliter dispositis, caulibus succulentis et fragilibus 10–20 cm longis ubi florentibus et saepe radicantibus crassis sed non tuberosis. *Folia* sessilia, oblanceolato-elliptica, 2–4 (–8) cm longa, 0,5–1,5 (–2) cm lata, acuta gradatim constricta ad basim, dorsoventraliter complanata sed aliquantum succulentia, glabra sed ciliis subdistantibus, viridia vel saepe margine rubrotincto; vaginae foliorum 0,2–0,5 cm longa. *Hydathodes* in series una densa secus marginem superum et inferum et aliquot dispersae supra, vix visibles. *Inflorescentia* terminalis spiciformibus, floribus aliquot pentameris in dischasiis sessilibus, caulibus erectis glabris et bracteis folia similis. *Sepala* oblongo-elliptica, 3,5–4,5 mm longa, arista brevi in quoque apice acuto, glabra sed ciliis marginalibus, succulentia, viridia. *Petala* oblongo-ovata, 5–6 mm longa, acuta et appendice dorsali distincta in quoque petalo, connata et tubo c. 1 mm longa, apicibus loborum recurvis, alba. *Stamina* 4–5 mm longa, antheris nigris 0,8–1 mm longis, filamentis latis factis ad basim. *Squamae* transverse oblongae, 0,2–0,3 × 0,8–1 mm, plerumque truncatae, vix constrictae ad basim, leviter succulentae, flavae. *Carpella* ovariis gracilibus reniformibus, stylis tenuibus et stigmatibus terminalibus parvis; ovarium laevis et 26–34 ovulis elongatis et papillis serialibus.

*Type:* Cape, Wittekloof, *Compton 2819* (BOL, holo!).

Perennials with usually several rosettes with leaves spirally but loosely arranged at the end of fleshy and brittle branches 10–20 cm long when flowering and often with thick but not tuberous roots, with old leaves usually soon wearing off. *Leaves* sessile, oblanceolate-elliptic, 2–4 (–8) cm long, 0,5–1,5 (–2) cm broad, acute and gradually tapering towards the base, abruptly shortened on the erect branch which ends in the inflorescence, dorsiventrally flattened but somewhat convex, glabrous except for subdistant cilia which are rarely slightly recurved, green or often tinged red along the margin; sheath 0,2–0,5 cm long and formed by the partial fusion of the leaf bases. *Hydathodes* arranged in a dense row along the upper and lower margin and few scattered over the upper surface, hardly visible. *Inflorescence* terminal, spike-like, with several 5-merous flowers in sessile dichasia, with a glabrous erect stem not distinguishable from a vegetative branch but with short leaf-like bracts. *Sepals* oblong-elliptic, 3,5–4,5 mm long, with acute apices often with a short awn, glabrous except for some marginal cilia, fleshy green. *Petals* oblong-obovate, 5–6 mm long, acute and each with a distinct dorsal appendage, fused into a tube c. 1 mm long, with apices of the lobes recurved, white. *Stamens* 4–5 mm long, with black anthers, 0,8–1 mm long and longer than broad, with filaments somewhat broadened towards the base and constricted where fused to the petal tube. *Squamae* transversely oblong, 0,2–0,3 × 0,8–1 mm, usually truncate, somewhat constricted towards the base, slightly fleshy, yellow. *Carpels* with slender reniform ovaries and with long thin styles half to two-thirds of the length of the ovaries and with small terminal stigmas; ovary smooth and with 26–34 elongate ovules covered with rows of papillae.

In moist shaded rock crevices on rock faces in ravines and recorded only from the north-eastern Witteberg and northern Swartberg.

CAPE—3320 (Montagu): Wittekloof (-BD), *Compton 2819* (BOL); Pieter Meintjies (-AD), *Marloth 9987* (PRE).
—3321 (Ladismith): west of Bosluiskloof (-AD), *Tölken 4106* (BOL).
—3322 (Oudtshoorn): near Prince Albert (-AA), *Stokoe s.n.* (BOL).

9. **Crassula brevifolia** Harv. subsp. **psammophila** Toelken, subsp. nov. ab subsp. *brevifolia* caulibus et foliis latis, carpellis laevibus et ovulis 10–12; ab *C. macowaniana* apicibus obtusis foliorum et sepalis acutis differt.

Fruticuli usque ad 20 cm alti, caulibus effusis vel decumbentibus, parum ramosi, internodiis inter folia brevissimis et caulibus infra partem foliis (0,3) 0,4–0,5 cm lata, obtusa, patentia, glaucesentia vel saepe fusca. *Inflorescentia* corymbo-thyrsus, pedunculo 4–8 cm longo, bracteis anguste triangularibus plerumque longioribus 2 mm. *Petala* oblonga, crista dorsale sed sine appendice dorsale in quoque petalo, alba suffosa rosea. *Antherae* atro-purpureae. *Carpella* laevia et 10–12 ovulis.

*Type:* Cape, hills along the Kammas River on the road between Port Nolloth and the Grootmis, *Tölken 4004* (BOL, holo!).

Shrublets up to 20 cm high, with spreading branches rarely decumbent, little branched, with internodes between the leaves not visible and branches below the region with leaves (0,3–) 0,4 cm in diameter. *Leaves* (2–) 2,5–4 cm long, (0,3–) 0,4–0,5 cm broad, with rounded apex, straight and spreading at about right angles to the stem, dull green or more often brownish-red and without bloom. *Inflorescence* an almost flat-topped thyrse, with a peduncle 4–8 cm long, with narrowly triangular bracts usually longer than 2 mm and longer than broad. *Petals* oblong and each with a dorsal ridge but usually without dorsal appendage, white tinged pink. *Anthers* dark purple. *Carpels* glabrous and with 10–12 ovules.

CAPE—2816 (Oranjemund): Peacock's Bay (-DA), *Tölken 3368* (BOL); Holgat River (-DD), *Tölken 1855* (BOL).

—2916 (Port Nolloth): along Kammas River (-BB), *Tölken 3465* (BOL); 4404 (BOL). Springbok ?, *Herre* in SUG *5879* (GRA).

10. **Crassula campestris** (Eckl. & Zeyh.) Endl. ex Walp. subsp. **pharnaceoides** (Fisher & C. A. Mey.) Toelken, comb. nov. et stat. nov.

*Crassula pharnaceoides* Fischer & C. A. Mey. in Ind. Sem. Hort. Petrop. **8:** 56 (1841); Walp., Rep. **2:** 254 (1843); Friedr. in Prodr. Fl. S. W. Afr. **52:** 33 (1968). Type: Abyssinia, near Adoa, *Schimper s.n.* (B!; G!; GRA!; P!; S!).
*Tillaea pharnaceoides* (Fisher & C. A. Mey.) Steudel, Nomencl. Bot. ed. 2, **2:** 687 (1841); Britt., Fl. Trop. Afr. **2:** 387 (1871).

The seeds of this subspecies are about twice as long as broad while they are scarcely longer than broad in the subsp. *campestris.*

Both Fischer & C. A. Meyer and Steudel derived their name from a printed label inscribed *Tillae pharnaceoides* but without description by Hochstetter. Fischer and Meyer described it as a species of *Crassula* so that Steudel's reference eight months later can be construed as a new combination, as it is based on the same type material.

11. **Crassula capensis** (L.) Baill. var. **albertiniae** (Schonl.) Toelken, comb. nov. et stat. nov.

*C. albertiniae* Schonl. in Ann. Bolus Herb. **2:** 93 (1917) et in Trans. Roy. Soc. S. Afr. **17:** 207 (1929). Type: Cape, Onverwacht, *Muir* 1315 (GRA, holo!).

—— var. **promontorii** (Schonl. & Bak. f.) Toelken, comb. nov. et stat. nov.
*C. promontorii* Schonl. & Bak. f. in J. Bot., Lond. **36:** 366 (1898) et in Trans. Roy. Soc. S. Afr. **17:** 204 (1927). Type: Cape, Kasteelberg, *Wolley Dod 1624* (GRA, holo!; SAM!).

The var. *promontorii* is distinguished from the typical variety by the absence of a peduncle while the var. *albertiniae* is characterized by its leaves with entire margin and they are often produced after flowering.

12. **Crassula capitella** Thunb. subsp. **capitella**

*C. capitella* Thunb. in Acta Nova Phys.-Med. Acad. Caes. Leop.-Carol., Nat. Cur. **6:** 330, 339 (1778) et Fl. Cap. ed. Schultes 286 (1823); L. f., Suppl. 190 (1781); Ait., Hort. Kew. ed. 1, **1:** 394 (1789). Type: Cape, between Cannaland and Olifant's River, *Thunberg* in Herb. Thunberg *7732a* (UPS, lecto!).

*C. spicata* Thunb. in Acta Nova Phys.-Med. Acad. Caes. Leop.- Carol., Nat. Cur. **6:** 329, 333 (1778) et Fl. Cap. ed. Schultes 284 (1823); L. f., Suppl. 189 (1781). Type: Cape, Karoo, *Thunberg* in Herb. Thunberg *7796* (UPS, holo!).

Although *C. capitella* and *C. spicata* were described by Thunberg in the same publication the former name is prefered because it represents the more commonly found form of this species.

*C. capitella* is treated here as a species complex with five different subspecies which show an almost complete range from shrubs, to perennials with a basal rosette, to biennials. The petal apices vary from recurved to erect with the dorsal appendages becoming more enlarged and eventually being found in the terminal position.

1 Petal with smooth appendage in terminal position:
  2 Bracts subtending the part-inflorescences glabrous; squamae emarginate . . . **C. capitella** subsp. **capitella**
  *2* Bracts subtending part-inflorescences densely hairy; squamae truncate . . . . **C. capitella** subsp. **nodulosa**
*1* Petal with denticulate appendage in dorsal position:
  3 Sepals covered with recurved hairs and marginal cilia; squamae oblong . . . **C. capitella** subsp. **enantiophylla**
  *3* Sepals glabrous or with a few marginal teeth; squamae transversely oblong to square:
    4 Leaves with obtuse or rounded apices; petals scarcely recurved . . . **C. capitella** subsp. **meyeri**
    *4* Leaves with acute apices; petals recurved to about half their length . . **C. capitella** subsp. **thyrsiflora**

—— subsp. **enantiophylla** (Bak. f.) Toelken, comb. nov. et stat. nov.
*C. enantiophylla* Bak. f. in Bull. Herb. Boiss. ser. 2, **3:** 816 (1903). Type: Transvaal, Houtbos, *Rehmann 6372* (Z, holo!; BM!).

—— subsp. **meyeri** (Harv.) Toelken, comb. nov. et stat. nov.
*C. meyeri* Harv., Fl. Cap. **2:** 344 (1862). Type: Natal, between the Omsamculo and Omcomas Rivers, *Drege s.n.* (S, holo!; G!; P!).

—— subsp. **nodulosa** (Schonl.) Toelken, comb. nov. et stat. nov.
*C. nodulosa* Schonl. in Rec. Albany Mus. **1:** 56 (1903) et in Trans. Roy. Soc. S. Afr. **17:** 247 (1929). Type: Cape, Warrenton, *Adams 28* (GRA, holo!; PRE!; SAM!).

—— subsp. **thyrsiflora** (Thunb.) Toelken, comb. nov. et stat. nov.
*C. thyrsiflora* Thunb. in Acta Nova Phys.-Med. Acad. Caes. Leop.-Carol., Nat. Cur. **6:** 329, 339 (1778) et Fl. Cap. ed. Schultes 283 (1821); L. f., Suppl. 190 (1781). Type: Cape, between Sundays and Fish River, *Thunberg* in Herb. Thunberg *7801* (UPS, holo!).
*C. turrita* Thunb. in Acta Nova Phys.-Med. Acad. Caes. Leop.-Carol., Nat. Cur. **6:** 329, 336 (1778) et Fl. Cap. ed. Schultes 285 (1823); L. f., Suppl. 189 (1781). Type: no type preserved.

13. **Crassula congesta** N.E. Br. subsp. **laticephala** (Schonl.) Toelken, comb. nov. et stat. nov.
*C. laticephala* Schonl. in Rec. Albany Mus. **2:** 457 (1913). Type: Cape, Riversdale, *Volschenk s.n.* (GRA, holo!; K!; SAM!).

The subsp. *congesta* which occurs to the north of the Witteberge is distinguished by its blunt leaf apices which are curved upwards, while the subsp. *laticephala* with its acute recurved leaf apices occurs to the south-east of these mountains.

14. **Crassula corallina** Thunb. subsp. **macrorrhiza** Toelken, subsp. nov. ab subsp. *corallina* radicibus principalibus tuberosis 0,3–0,8 (–1,2) cm in diametro, ramis sine radicibus adventiis et carpella stylis distinctis differt.
*C. corallina* sensu Higgins in J. S. Afr. Bot. **24:** 115–118, fig. 2A (1958); sensu Friedr. in Prodr. Fl. S. W. Afr. **52:** 26 (1968), non Thunb.
Plantae caulibus brevis erectis vel longioribus decumbentibus et sine radicibus adventiis vel rare solum in node singulare, radicibus principalibus tuberosis 0,3–0,8 (–1,2) cm in diametro. *Folia* angulato-obovata, fere obtriangularia, 0,4–0,5 cm longa, (0,35–) 0,4–0,5 cm lata, plerumque obtusa, texta strato cerae in paginis exposis. *Carpella* stylis distinctis ovariis recurvis ad apicem et stigmatibus sessilibus lateralibus.

*Type:* South West Africa, Klein Karas, *Dinter 4773* (PRE, holo!; K!).

Plants with short erect, or with longer decumbent or prostrate stems which are usually without adventitious roots, or, if present, then only at a single node at a time, with tuberous main roots 0,3–0,8 (–1,2) cm in diameter. *Leaves* angular-obovate to almost obtriangular, 0,4–0,5 cm long, (0,35–) 0,4–0,5 cm broad and usually with rounded apex, covered with a white waxy layer on the exposed surfaces. *Carpels* with indistinct styles and the broad upper part of the ovary recurved at the apex and with sessile lateral stigmas.

The subsp. *macrorrhiza* is restricted to Bushmanland and south-eastern South West Africa.
SOUTH WEST AFRICA—2718 (Grunau): Klein Karas (-CA), *Dinter 4773* (PRE, K).
—2818 (Warmbad): Warmbad (-BC), *Herre* in SUG *5773* (GRA).
CAPE—2717 (Vioolsdrif): Stinkfontein Plateaux, *Pearson 6204* (GRA).
*—2818* (Warmbad): 20 km east-south-east of Goodhouse (-CD), *Tölken 3681* (BOL).
—2820 (Kakamas): Kakamas (-DC), *Fuller 32* (BOL).
—2821 (Upington): Upington (-AC), *Simpson s.n.* (NBG).
—2917 (Springbok): 40 km north of O'Okiep (-BD), *Horrocks 17* (NBG).
—2918 (Gamoep): Aggenys (-BB), *Pearson 2945* (BOL, GRA, SAM).

—2919 (Pofadder): near Pofadder (-AB), *Barker 8357* (NBG).
—2921 (Kenhardt): 4 km west of Kenhardt (-AC), *Acocks 16 507* (PRE).

15. **Crassula decumbens** Thunb. var. **brachyphylla** (Adamson) Toelken, comb. nov. et stat. nov.

*C. brachyphylla* Adamson in J. S. Afr. Bot. **8:** 276 (1942). Type: Cape, Devil's Peak, *Ecklon & Zeyher 1852* (G!; GRA!; K!; S!; S!; SAM!).

The var. *brachyphylla* is usually distinguished from the typical variety by its club-shaped leaves and the broadly ovate petals, but plants from Bredasdorp are very similar to those of the var. *decumbens*.

16.**Crassula elegans** Schonl. & Bak. f. subsp. **namibensis** (Friedr.) Toelken, comb. nov. et stat. nov.

*C. namibensis* Friedr. in Mitt. Bot. Staatssamml. München **6:** 632, fig. 5 (1967) et in Prodr. Fl. S. W. Afr. **52:** 33 (1968). Type: South West Africa, Lüderitzbucht, *Merxmüller & Giess 3477* (M, neo).

The subsp. *namibensis* occurs in rock outcrops near Luderitz Bay and is distinguished from the typical subspecies by its blunt somewhat swollen trichomes on the leaves.

17. **Crassula elsieae** Toelken, sp. nov. ab *C. corallina* hydathodis marginalibus, squamis oblongo-cuneatis, habitione; ab *C. papillosa* foliis obovatis et sepalis oblongis differt.

Herbae perennes ramis prostratis vel decumbentibus usque ad 10 cm longis et rare 0,1 cm in diametro latioribus et non lignosis ad basim, radicibus adventiis secus ramum, foliis veteribus non caducis. *Folia* sessilia, obtusa et saepe aliquantum angulata, 0.2 0.4 cm longa, 0,2–0.3 mm lata et basi cuneata plana sed succulentescentia ad apicem, minute papillosa saltem ubi juvenia, viridia vel fusca; vaginae foliorum circiter 0,05 mm longa et membranacea. *Hydathodi* aliquot plus minusve seriales in marginibus foliorum, vix visibiles. *Inflorescentia* dichasium terminale (1–) 3–5 floribus pedicellatis et pentameris, pedunculo indistincto et bracteis ellipticis succulentibus. *Sepala* late oblonga, 1,5–2 mm longa, obtusa, succulenta, viridia. *Petala* oblonga vel oblanceolata, 2,5–3 mm longa, obtusa sine appendicibus dorsalibus, connata in tubum 0,2–0,4 mm longem, loborum apicis recurvis, albis vel eburneis. *Stamina* circiter 2 mm longa, antheris luteis 0,2–0,3 mm longis, filamentis aliquantum latentibus ad basim et vix constrictis ubi connatis petalorum tubo. *Squamae* oblongo-cuneatae, 0,4–0,6 × 0,3–0,4 mm, truncatae et aliquantum constrictae ad basim, vix succulentae, pallide flavae. *Carpella* ovariis late reniformibus gradatim constrictis in stylos breves stigmatibus terminalibus indistinctis; ovarium laeve et 4–6 ovulis elongatis dense tectum papillis serialis saepe indistinctis.

*Type:* Cape, Krakadouw Peak, *Esterhuysen 14 958* (BOL, holo!).

Perennials with prostrate or decumbent branches up to 10 cm long and rarely more than 1 cm in diameter and not woody towards the base, with adventitious roots along the stem, with old leaves remaining attached to the stem. *Leaves* sessile, obovate and often somewhat angular, 0,2–0,4 cm long, 0,2–0,3 mm broad, obtuse and with a cuneate base, flat but becoming more fleshy towards the apex, minutely papillose at least when young, green to brown; sheath c. 0,05 mm long and membranous. *Hydathodes* few, more or less clearly arranged in a row on the margin of the leaves, hardly visible. *Inflorescence* a terminal dichasium with (–1) 3–5 flowers pedicellate and 5-merous, with peduncle hardly distinguishable from the vegetative branches and with fleshy elliptic bracts. *Sepals* broadly oblong, 1,5–2 mm long, with rounded apex, fleshy green. *Petals* oblong to oblanceolate, 2,5–3 mm long, obtuse and without dorsal appendage, fused into a tube 0,2–0,4 mm long with apices of the lobes recurved, white or cream. *Stamens* c. 2 mm long, with yellow anthers 0,2–0,3 mm long, with filaments slightly broadened towards the base and hardly constricted where fused to the petal tube. *Squamae* oblong-cuneate, 0,4–0,6 × 0,3–0,4 mm, truncate and somewhat constricted towards the base, slightly fleshy, pale yellow. *Carpels* with broadly reniform to almost pear-shaped ovaries gradually constricted into short styles with indistinct terminal stigmas; ovary smooth and with 4–6 elongate ovules densely covered with often indistinct rows of papillae.

In shaded places under rocks or in rock basins and known only from the northern Cedarberg.

This species is very rare and all the plants recorded of it were collected by the very observant collector Miss Elsie Esterhuysen, in honour of whom the species is named.

CAPE—3219 (Wuppertal): Krakadouw Peak (-AA), *Esterhuysen 14 958* (BOL); Krakadouwsberg (-AA), *Esterhuysen 7517* (BOL).

18. **Crassula ericoides** Haw. subsp. **tortuosa** Toelken, sp. nov. ab subsp. *ericoides* prostrato habitu et ovariis ovulis quatuor differt.

Plantae prostratae vel decumbentes, ramis precique ex base et ramis principalibus tortuosis. *Folia* (0,2–) 0,3–0,4 cm longa rare usque ad 0,1 cm lata et foliis veteribus remanentibus in ramis. *Petala* 0,2–0,3 cm longa, aliquantum expansa et saepe leviter recurva. *Carpella* circiter 0,2 cm longa et ovulis quatuor.

*Type:* Cape, top of Prince Alfred's Pass, *Tölken 3757* (BOL, holo!).

Plants prostrate or decumbent, branching mainly from the base and with main branches usually tortuous. *Leaves* (0,2–) 0,3–0,4 cm long, rarely broader than 0,1 cm and old leaves remaining attached to the branches for some time. *Petals* 0,2–0,3 (–0,4) cm long, spreading and often slightly recurving. *Carpels* c. 0,2 cm long and with 4 ovules.

On shallow soil on rocks at high altitude in the mountains from the Great Winterhoek to the Outeniqua mountains.

CAPE—3321 (Ladismith): Cloetes Pass (-DD), *Zinn* in SAM *59 071.*
—3322 (Oudtshoorn): Spitskop (-BC), *Thorne* in SAM *51 442.*
—3323 (Willowmore): top of Prince Alfred Pass (-CC), *Tölken 3757* (BOL); near Joubertina (-DD), *Esterhuysen 13 648* (BOL).
—3324 (Steytlerville): Winterhoek mountains, *Zeyher 2523* (PRE, SAM).

19. **Crassula exilis** Harv. subsp. **exilis**

*C. exilis* Harv., Fl. Cap. **2:** 347 (1862); Schonl. in Trans. Roy. Soc. S. Afr. **17:** 252 (1929). Type: Cape, Namaqualand, *Whitehead s.n.* (TCD, holo!).

*C. exilis* has often been wrongly interpreted as its typical form has very fleshy leaves and a clearly defined peduncle, unusual features within the section *Rosulares*, but the variation within the species complex shows a complete range of these characters.

1 Peduncle with short spreading blunt hairs (usually not visible without lens) . . . . . **C. exilis** subsp. **exilis**
*1* Peduncle glabrous . . . . . . . . . . . . . . . **C. exilis** subsp. **sedifolia**
*1'* Peduncle with spreading slightly recurved hairs c. 1 mm long . . **C. exilis** subsp. **cooperi**

—— subsp. **sedifolia** (N. E. Br.) Toelken, comb. nov. et stat. nov.

*C. sedifolia* N. E. Br. in Gard. Chron. ser. 3, **32:** 429 (1902); Schonl. in Trans. Roy. Soc. S. Afr. **17:** 236 (1929). Type: South Africa without precise locality, *MacOwan s.n.* (K, holo!).

—— subsp. **cooperi** (Regel) Toelken, comb. nov. et stat. nov.

*C. cooperi* Regel in Gartenflora 36, t. 786 (1874); Schonl. in Trans. Roy. Soc. S. Afr. **17:** 236 (1929). Type: South Africa, without precise locality. (LE, holo!).

20. **Crassula expansa** Dryand. in Ait. subsp. **expansa**

*C. expansa* Dryand. in Ait., Hort. Kew. ed. 1, **1:** 390 (1789); Harv., Fl. Cap. **2:** 354 (1862); Schonl. in Trans. Roy. Soc. S. Afr. **17:** 184 (1929). Type: Caput Bonae Spei, *Masson s.n.* (BM, holo!).

This very variable species complex of which five different subspecies occur in Southern Africa is very widespread in Africa. Some of the subspecies often occur geographically very close to one another but usually remain ecologically isolated.

1 Sepals and leaves covered with spreading hairs:
    2 Hydathodes on margin of leaves; moist places on Swartberg . . . . . . . **C. expansa** subsp. **peculiaris**
    *2* Hydathodes scattered over the upper leaf surface; northern Natal and Transvaal **C. expansa** subsp. **fragilis**

*1* Sepals and leaves glabrous:

3 Leaves with one or two rows of hydathodes; stems without adventitious roots; widespread from northern Natal to southern and northern Cape . . . . . **C. expansa** subsp. **expansa**

*3* Leaves usually with two rows of hydathodes; stems with woody adventitious roots; along the coast from Port Elizabeth to the Cape Peninsula . . . . . . . . **C. expansa** subsp. **filicaulis**

*3'* Leaves with hydathodes scattered at least over the upper surface; stems usually with adventitious roots; Namaqualand and into south-western South West Africa **C. expansa** subsp. **pyrifolia**

—— subsp. **filicaulis** (Haw.) Toelken, comb. nov. et stat. nov.
*C. filicaulis* Haw. in Phil. Mag. **24:** 187 (1824); DC., Prodr. **3:** 384 (1828); Eckl. & Zeyh., Enum. 295 (1837), partly. Iconotype: plate 768 (K, lecto!).

—— subsp. **fragilis** (Bak.) Toelken, comb. nov. et stat. nov.
*C. fragilis* Bak. in J. Linn. Soc. (Bot.) **22:** 469 (1887). Type: central Madagascar, *Baron 3348* (K, holo!).
*C. browniana* Burtt Davy, Fl. Transv. 141 (1925); Schonl. in Trans. Roy. Soc. S. Afr. **17:** 185 (1929). Type: Transvaal, near Lydenburg, *Wilms 518* (K, holo!).

—— subsp. **peculiaris** Toelken, subsp. nov. ab subspeciebus aliis foliis hirsutis et radicibus non gralliformibus; ab subsp. *fragile* floribus axillaribus et habitate altitudine differt.
Herbae perennes ramis prostratis usque ad 30 cm longes et interdum radicis adventiis gracilibus. *Folia* petiolis usque ad 0,3 cm longis; lamina ovata vel late elliptica (0,2–) 0,4–0,6 cm lata, dorsoventraliter complanata, tecta pilis gracilibus et hydathodis paucis secus margines. *Flores* singulares in axilis foliorum et saepe non ad apices ramorum. *Sepala* longitudine c. 3/4 petalis partes aequantia, acuta vel obtusa et pubescentia.

*Type:* Cape, east of Oliewenberg, *Esterhuysen 28 832* (BOL, holo!).

Perennials with prostrate herbaceous branches up to 30 cm long, forming irregular mats and sometimes with fine adventitious roots. *Leaves* with petioles up to 0,3 cm long; lamina ovate to broadly elliptic, (0,2–) 0,4–0,6 cm broad, dorsiventrally compressed, covered with long fine hairs and with few hydathodes along the margin. *Flowers* borne singly in the axils of the leaves and often not even at the apical part of the stem. *Sepals* three-quaters of the length of the petals, bluntly acute and covered with scattered hairs.

On moist shaded areas and usually under rocks at an altitude of above 1 500 m and recorded only from the vicinity of the Swartberg Pass.

CAPE—3322 (Oudtshoorn): Swartberg Pass (-AC), *Esterhuysen 4559* (BOL); east of Oliewenberg (-AC), *Esterhuysen 28 832* (BOL).

——subsp. **pyrifolia** (Compton) Toelken, comb. nov. et stat. nov.
*C. pyrifolia* Compton in J. Bot. Lond. **70:** 283 (1932). Type: Cape, near Bitterfontein, *Moller* sub Compton *3954* (BOL, holo!; K!).

21. **Crassula garibina** Marl. & Schonl. subsp. **glabra** Toelken, subsp. nov. ab subsp. *garibina* foliis glabris vel rare papillis minutis sine apicibus sphaericis differt.
Plantae praeter calycem minute papillosam glabrae. *Folia* viridia vel viridi-flava et glabra rare juvenilia minute papillosa.

*Type:* Cape, Geselskapbank, *Tölken 3687* (BOL, holo!).

Plants glabrous except for minutely papillose calyx. *Leaves* green to yellowish-green and glabrous or rarely minutely papillose when young.
CAPE—2917 (Springbok): Eenriet mountain (-BB), *Smithers s.n.* (BOL); 10 km north of Steinkopf (-BB), *Tölken 4324* (BOL).
—2918 (Gamoep): Geselskapbank (-AA), *Tölken 3687* (BOL).

22. **Crassula globularioides** Britt. subsp. **argyrophylla** (Schonl. & Bak. f.) Toelken, comb. nov. et stat. nov.
*C. argyrophylla* Diels ex Schonl. & Bak. f. in J. Bot., Lond. **40:** 290 (1902); Diels in Bot. Jahrb. **39:** 465 (1907); Burtt Davy, Fl. Transv. 141 (1926). Syntypes: Transvaal, Braamfontein, *Gilfillan* sub Galpin *6211* (GRA!; BOL!; PRE!); Lydenburg, *Wilms 527* (BM!)

—— subsp. **illichiana** (Engl.) Toelken, comb. nov. et stat. nov.
*C. illichiana* Engl. in Diels et Engl. in Bot. Jahrb. **39:** 465 (1907). Syntypes: Tanzania, Usambara, *Buchwald 174* (K!); Manca near Sakara, *Engler 1073* (B).
The subsp. *argyrophylla* is distinguished from the very similar subsp. *illichiana* by only one bract without part-inflorescences on the peduncle, and its marginal cilia becoming shorter towards the base of the leaves.

23. **Crassula grammanthoides** (Schonl.) Toelken, comb. nov. et stat. nov.
*Dinacria grammanthoides* Schonl. in Bull. Herb. Boiss. ser. 1, **5:** 859 (1897). Type: Cape, Swartberg near Caledon, *Schlechter 5570* (GRA, holo!; BOL!).
*C. grammanthoides* is very similar to *C. depressa* except that instead of a terminally placed stigma it is here in a lateral position. This represents an intermediate stage between species of *Crassula*, such as *C. depressa*, and *Dinacria filiformis* and *Dinacria sebaeoides* where the styles are variously enlarged to bring the stigma into a lateral position.

24. **Crassula lanuginosa** Harv. var. **pachystemon** (Schonl. & Bak. f.) Toelken, comb. nov. et stat. nov.

*C. pachystemon* Schonl. & Bak. f. in J. Bot., Lond., **36:** 367 (1898); Schonl. in Trans. Roy. Soc. S. Afr. **17:** 258 (1929). Type: Cape, near Graaff Reinet, *Bolus 437* (GRA, lecto!; K!; PRE!).
*C. ernestii* Schonl. & Bak. f. in J. Bot., Lond. **40:** 283 (1902); Schonl. in Trans. Roy. Soc. S. Afr. **17:** 258 (1929). Type: Cape, Bowker's Park, *Galpin 2563* (GRA, holo!; BM!).

The var. *lanuginosa* is distinguished from the typical variety by its usually smaller leaves with an acute apex and one to few terminal hairs. The two varieties occur without any intermediates in the vicinity of Cradock but between Tarkastad and Queenstown some intermediates have been found.

25. **Crassula latibracteata** Toelken, sp. nov. ab *C. cultrata* et *C. rogersio* petalis oblongo-oblanceolatis et thyrso capitato circumcinato bracteis late oblanceolatis differt.

Frutices perennes usque ad 40 cm alti, plerumque multum ramosi et ramis superis rectis et erectis, infernis saepe decumbentibus 0,1–0,3 cm in diametro et cortice chartaceo, foliis veteribus deciduis. *Folia* sessilia, obovata vel aliquantum falcata, (0,8–) 1–2 (–2,5) cm longa, 0,4–0,7 cm lata, obtusa dorsoventraliter complata et leviter convexa sed marginibus argutis, puberula vel glabra, viridia ad lutea-viridia et saepe marginibus corneis rubris; vaginae foliorum 0,1–0,2 cm longae. *Hydathodi* diespersae in paginis superibus et infernis, conspicuae. *Inflorescentia* thyrsus terminalis densus et fere capitatus 1–2 dichasiis floribus pentameris sessilibus, pedunculo puberulo vel glabrescente 15–25 cm longo, bracteis obovatis ad late oblongis saepe marginibus membraneis et obtangentibus inflorescentiis. *Sepala* oblongo-triangularia, 2–2,5 mm longa, obtusa, succulentissima ad apicem, puberula, viridia vel luteoviridia. *Petala* oblonga vel oblongo-oblanceolata, 3–3,5 mm longa, appendicibus dorsalibus elongatis, 0,5–0,8 mm connata, eburnea. *Stamina* 2,5–3 mm longa, antheris luteis 0,5–0,8 mm longis, filamentis non latioribus ad basim et aliquantum constrictis ubi connatis tubo petalorum. *Squamae* oblongo-cuneatae, 0,6–0,8 × 0,4–0,6 mm, truncatae vel leviter emarginatae, plerumque aliquantum constrictae ad basim, leviter succulentae, luteae. *Carpella* ovariis reniformibus abrupte constrictis ad styles breves crassos stigmatibus latis viridibus et saepe aliquantum lateralibus; ovarium ciliis brevibus secus suturam et 10–14 ovulis elongatis porcis leviter papillosis.

*Type:* Cape, Riebeeck East, *Tölken 4344* (BOL, holo!).

Perennials forming shrublets up to 40 cm high, usually much branched and with upper branches erect and straight, with lower branches often wiry and decumbent 0,1–0,3 cm in diameter and with peeling bark, with old leaves deciduous. *Leaves* sessile, obovate to somewhat falcate and turned to the one side of the stem, (0,8–) 1–2 (–2,5) cm long, 0,4–0,7 cm broad, with rounded apex, dorsiventrally flattened and slightly convex on either surface but with sharp margins, puberulous to glabrous, green to yellowish-green and often with red horny margin; sheath 0,1–0,2 cm long and formed by the partial fusion of the leaf bases. *Hydathodes* scattered over the upper and lower leaf margin, more or less conspicuous. *Inflorescence* a terminal dense almost capitate thyrse with one to three dichasia with sessile 5-merous flowers, with peduncle puberulous to glabrascent 15–25 cm long with obovate to broadly oblong bracts often with a membranous margin covering the lower parts of the inflorescence. *Sepals* oblong-triangular, 2–2,5 mm long, with rounded apices often very swollen so that it appears to be recurved, puberulous, green to yellowish-green. *Petals* oblong to oblong-lanceolate, 3–3,5 mm long, each with elongate dorsal appendage in terminal position, fused into a tube 0,5–0,8 mm long, with short swollen apices curved downwards, cream. *Stamens* 2,5–3 mm long, with yellow anthers 0,5–0,8 mm long, with filaments not broadened towards the base and somewhat constricted where fused to the petal tube. *Squamae* oblong-cuneate, 0,6–0,8 × 0,4–0,6 mm, truncate or slightly emarginate, usually somewhat constricted towards the base, slightly fleshy, yellow. *Carpels* with reniform ovaries abruptly constricted into short stout styles ending in broad green and somewhat laterally placed stigmas; ovary with short cilia along the suture and with 10–14 elongate ovules covered with faintly papillose ridges.

CAPE—3226 (Fort Beaufort): Adelaide (-BC), *Rogers 27 680* (PRE).

—3325 (Port Elizabeth): Suurberg (-BD), *Barker 4941* (NBG).

—3326 (Grahamstown): Riebeeck East (-AA), *Tölken 4344* (BOL); near Southwell (-CA), *Acocks 11 086* (PRE).

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26. **Crassula mesembryanthoides** (Haw.) Dietr. subsp. **hispida** (Haw.) Toelken, comb. nov. et stat. nov.

*Globulea hispida* Haw. in Phil. Mag. **66:** 30 (1825). Iconotype: plate 762 (K, lecto!).

*Crassula hispida* (Haw.) Dietr., Syn. Pl. **2:** 1031 (1840).

The internodes are very short (0,3–0,5 cm long) at the base of the branches in the subsp. *hispida* while they are usually 1–1,5 cm long in the subsp. *mesembryanthoides.* p173

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27. **Crassula minuta** Toelken, sp. nov. ab *C. vaillantio* sepalis petales aequantibus et squamis transverse oblongis et abrupte cuneatis; ab *C. decumbenti* 5 p foliis ad 3 mm longes et floribus terminalibus differt.

Herbae annuae ramis erectis 1–3 cm longis leviter rigidis, glabrae, internodiis aequalibus. *Folia* sessilia, linearia vel elliptica, 0,1–0,2 (–0,3) cm longa, 0,05–0,1 cm lata, plerumque obtusa, plus minusve plana supra et convexa subtus, glabra, succulenta, viridia vel testacea; vaginae foliorum c. 0,05 cm longa, membranacea.

*Hydathodi* paucae secus marginem, inconspicuae. *Inflorescentia* plerumque flores singulares terminales et pedicellis brevibus. *Sepala* elliptico-lanceolata, 1–1,5 mm longa, acuta, glabra, viridia vel testacea. *Petala* lanceolata, 1–1,5 mm longa, obtusa et sine appendicibus dorsalibus, connata tubo ad 0,3 mm longam, effusa alba vel eburnea et saepe rubrotincta. *Stamina* c. 1 mm longa, antheris flavis c. 0,1 mm longis et latis, filamentis vix latis factis ad bases. *Squamae* transverse oblongatae et abrupte cuneatae, 0,4–0,5 × 0,5–0,6 mm, truncatae abrupte constrictae ad bases, paene membranaceae, pallide flavae vel albae. *Carpella* ovariis oblongo- reniformibus gradate constrictis ad styles breves et stigmatibus terminalibus; ovarium leve et 2–4 ovulis elongatis leviter papillosis.

*Type:* Cape, Scorpionsberg, *Esterhuysen 12 233* (BOL, holo!; PRE!).

Annuals with erect branches 1–3 cm long and usually more or less wiry, glabrous, with pairs of leaves at about equal distances from one another. *Leaves* sessile, linear-elliptic, 0,1–0,2 (–0,3) mm long, 0,05–0,1 cm broad, usually obtuse, more or less flat above and convex below, glabrous, fleshy, green to reddish-brown; sheath c. 0,05 cm long, membranous. *Hydathodes* few along the margin, inconspicuous. *Inflorescence* usually single 4-merous flowers on short pedicels at the end of branches. *Sepals* elliptic- lanceolate, 1–1,5 mm long, bluntly, acute, glabrous, green to reddish-brown. *Petals* lanceolate, 1–1,5 mm long, obtuse and without dorsal appendages, fused into a tube 0,3 mm long, spreading, white or cream and often tinged red. *Stamens* c. 1 mm long and broad, with filaments scarcely broadened downwards and hardly fused to the tube. *Squamae* transverely oblong and abruptly cuneate, 0,4–0,5 × 0,5–0,6 mm, truncate, abruptly constricted towards the base, almost membranous, pale yellow or white. *Carpels* with oblong-reniform ovaries gradually constricted into short styles and with terminal stigmas; ovary smooth and with 2–4 elongate ovules which are faintly papillose.
CAPE—3219 (Wuppertal): Scorpionsberg (-AC), *Esterhuysen 12 233* (BOL, PRE); Tafelberg (-AC), *Esterhuysen 13 854* (BOL).

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28. **Crassula montana** Thunb. subsp. **quandrangularis** (Schonl.) Toelken, comb. nov. et stat. nov.
*C. quadrangularis* Schonl. in Rec. Albany Mus. **1**: 57 (1903). Type: Cape, Laingsburg, *Marloth 2512* (GRA, holo!).

The squamae are scarcely constricted towards the base and the inflorescence is a flat-topped thyrse in the subsp. *quadrangularis*.

29. **Crassula multicava** Lem. subsp. **floribunda** Friedr. ex Toelken, subsp. nov. ab subsp. *multicava* inflorescentia floribus pentameris et sine gemmis adventitis differt.

Plantae erectae ramis rigidis 0,3–0,6 cm in diametro ubi foliis et glabrae vel hirsutae. *Inflorescentia* dichasiis floribus multis, braceis liniaribus apicibus obtusis, sine gemmis adventitis et floribus pentameris. *Petala* 5–6 mm longa et remanentia post florescentiam, alba vel eburnea. *Ovula* elongata et circiter dupla longiora suo diametro, tecta seriebus papillarum acutarum.

*Type:* Natal, old Tugela bridge (-AB), *Strey 4209* (PRE, holo!; NH!).

Plants erect with stiff branches 0,3–0,6 cm in diameter when with leaves, and the whole plant glabrous to hairy. *Inflorescence* with many-flowered dichasia with narrowly oblong bracts with blunt apices, without adventitious buds, with 5-merous flowers. *Petals* 5–6 mm long, recurved and remain so after flowering, white or off-white. *Ovules* elongate to about twice as long as broad, covered with rows of pointed papillae.
NATAL—2931 (Stanger): old Tugela bridge (-AB), *Strey 4209* (NH, PRE).
2930 (Pietermaritzburg): Inanda (-DB), *Wood 597* (BOL, SAM). Durban Botanic Gardens, *Wood 11 744* (NH, PRE, SAM).

30. **Crassula multiflora** Schonl. & Bak.f. subsp. **leucantha** (Schonl. & Bak.f.) Toelken, comb. nov. et stat. nov.

*C. leucantha* Schonl. & Bak.f. in J. Bot., Lond. **36:** 369 (1898); Schonl. in Trans. Roy. Soc. S. Afr. **17**: 262 (1929). Type: Cape, Houwhoek, *Schlechter 7378* (GRA, holo!; BM!; BOL!; G!; K!; P!; Z!).

This plant is known only from the type collection which differs from plants of typical *C. multiflora* by its oblanceolate leaves which are rarely longer than 2,5 cm.

31. **Crassula muscosa** L. var. **muscosa**

*C. muscosa* L., Pl. Rar. Afr. 10 (1760) et Mantissa altera 361 (1771); Harv., Fl. Cap. **2**: 351 (1862), partly, excl. specimens cited; Tölken in J. S. Afr. Bot. **38**: 70 (1972). Type: Cape, sine leg. in Herb. Burmann (G, holo!).

*C. lycopodiodes* Lam., Dict. 2: 173 (1786); Harv., Fl. Cap. **2**: 351 (1862); Schonl. in Trans. Roy. Soc. S. Afr. **17**: 189 (1929); Friedr. in Prodr. Fl. S. W. Afr. **52**: 31 (1968). Type: Africa, sine leg. in Herb. Lamarck (P–LA, holo!).

The different varieties of this species complex often grow in different ecological niches but equally often they are found next to one another.

*C. polpodacea* and *C. propinqua* which seem to refer to the var. *sinuata* and var. *rigida* respectively were not adopted, because their diagnoses are so vague and the original material is often confused so that the taxa concerned cannot be recognized without doubt. *C. parvula* is, however, easily interpreted.

1 Stems at base without old leaves and with peeling bark; leaves yellow-green and up to 0,1 cm long . . . . . . . . . . . . . . . . . . **C. muscosa** var. **rigida**
*1* Stems with old leaves at the base; leaves grey-green 0,2–0,4 (–0,6) cm long:
    2 Squamae emarginate; stems wiry-woody with leaves adpressed 0,2–0,3 cm in diameter and up to 40 cm long . . . . . . . . **C. muscosa** var. **sinuata**
    *2* Squamae truncate; stems woody or if wiry then with spreading leaves and erect habitat:
        3 Stems with leaves 0,3–0,4 (–0,6) cm in diameter; plants more or less branched and up to 60 cm long . . . . **C. muscosa** var. **muscosa**
        *3* Stems with leaves c. 0,25 cm in diameter; plants erect tufts up to 15 cm high . . . . . . . . . . . . . . **C. muscosa** var. **parvula**

—— var. **parvula** (Eckl. & Zeyh.) Toelken, comb. nov. et stat. nov.
*Tetraphyle parvula* Eckl. & Zeyh., Enum. 294 (1837). Type: Cape, Botha's Berg, *Ecklon & Zeyher 1871* (S, lecto!).
*Crassula parvula* (Eckl. & Zeyh.) Endl. ex Walp., Repert. **2**: 253 (1843); Harv., Fl. Cap. **2**: 352 (1862).

—— var. **rigida** Toelken, var. nov. ab varietatibus aliis foliis usque ad 2 mm longis et obtusis, cortice cadenti membranaceo differt.
Plantae erectae 10–15 (–30) cm altae ramis principalibus ligneis et rigidis 0,2–0,5 (–0,8) cm in diametro sine foliis sed contice candenti membranaceo, ramis multis ad basim, ramis juvenibus foliis usque ad 0,3 mm in diametro et internodiis visilibus inter folia praecipue in exsiccata sed foliis veteribus deciduis. *Folia* ovata vel late ovata, 0,05–0,1 (–0,2) cm longa et lata, obtusa, apice effuso et gemma axillare in quoque axilla. *Squamae* truncatae.

*Type:* Cape, Stinkfontein, *Schlieben 11 530* (PRE, holo!; STE!).

Plants erect 10–16 (–30) cm high with rigid woody branches 0,2–0,5 cm thick without leaves and with peeling bark, branching mainly from the base and much branched, with younger branches with leaves up to 0,3 cm in diameter and with internodes visible between the leaves particularly in dried specimens, with old leaves deciduous. *Leaves* ovate to broadly ovate, 0,05–0,1 (–0,2) cm long and broad, obtuse, rarely more or less adpressed but with an axillary bud in the axil of all leaves, yellowish-green. *Squamae* truncate.

Occurs from the Cedarberg northwards through the mountains in Namaqualand and Richtersveld to just north of the Orange River.

—— var. **sinuata** Toelken, var. nov. ab varietatibus aliis ramis gracilibus sinuatis et squamis emarginatis.
Plantae ramis gracilibus sinuatis vel decumbentibus 30–50 (–80) cm longis, 0,2–0,3 (–0,4) cm in diametro foliis, minute ramosis et sine ramis axillaribus brevis, tenacibus et ligneis et internodiis non visibilibus inter folia adpressa, foliis veteribus non deciduis. *Folia* lanceolata 0,2–0,3 cm longa, 0,1–0,2 cm lata, acuta. *Squamae* emarginatae.

*Type:* Cape, near Komga, *Flanagan 1795* (BOL, holo!; GRA!; PRE!).

Plants with slender sinuous or decumbent branches 30–50 (–80) cm long, 0,2–0,3 (–0,4) cm in diameter with leaves, little branched and without short axillary branches, tough and woody and with internodes not visible between the leaves, with old leaves remaining attached to the stem. *Leaves* lanceolate 0,2–0,3 cm long, 0,1–0,2 cm broad, acute, yellowish-green rarely pale green. *Squamae* distinctly emarginate.

Occurs mainly in the triangle between Willowmore, Port Elizabeth and King William's Town.

32. **Crassula namaquensis** Schonl. & Bak.f. subsp. **comptonii** (Hutch. & Pillans) Toelken, comb. nov. et stat. nov.

*C. comptonii* Hutch. et Pillans, Botanist in S. Afr. 149 & illustr. (1946). Type: Cape, Vanrhyn's Pass, *Hutchinson 765* (K, holo!).

Within the species complex *C. namaquensis* the tendency for the rostrate petal apex to elongate from up to 1 mm in the subsp. *namaquensis* to 2 mm in subsp. *comptonii* and 2–3 mm in the subsp. *lutea* cannot be ignored. Similarly the petal colour changes from white or cream to pale yellow and bright yellow. The range of variation of the leaves found in the subsp. *namaquensis* covers the variation found in the whole species.

—— subsp. **lutea** (Schonl.) Toelken, comb. nov. et stat. nov.

*C. namaquensis* var. *lutea* Schonl. in Rec. Albany Mus. **1:** 117 (1904) et in Trans. Roy. Soc. S. Afr. **17:** 269 (1929). Type: Cape, Bokkeveld Karoo, *Marloth 3238* (GRA, holo!; K!).

*C. lutea* (Schonl.) Friedr. in Mitt. Bot. Staatssamml. **11:** 333 (1974).

33. **Crassula natans** Thunb. var. **filiformis** (Eckl. & Zeyh.) Toelken, comb. nov. et stat. nov.

*Bullardia filiformis* Eckl. & Zeyh., Enum. 290 (1837). Type: Cape, Platteklip, *Ecklon & Zeyher 1850* (GRA!; K!; S!; SAM!).

*Helophytum natans* (Thunb.) Eckl. & Zeyh. var *filiformis* (Eckl. & Zeyh.) Harv., Fl. Cap. **2:** 329 (1862), partly.

*Crassula natans* Thunb. forma filiformis (Eckl. & Zeyh.) Schonl. in Ann. Bolus Herb. **2:** 49 (1917).

The var. *filiformis* is much finer than the var. *natans* and the flowers are rarely up to 1 mm long and its petals do not recurve. The former grows usually on moist or marshy soil on the edge of the water, while the latter is often found in pools and under those conditions develops the typical broad floating leaves.

34. **Crassula nudicaulis** L. var. **herrei** (Friedr.) Toelken, comb. nov. et stat. nov.
*C. herrei* Friedr. in Mitt. Bot. Staatssamml. München **6:** 640, fig. 10 (1967). Type: Cape, Holgat River, *Herre* in SUG *8126* (M, holo!).

The typical var. *herrei* with almost terete leaves, as illustrated by Friedrich (1967) is an extreme form of a plant that has less fleshy leaves and marginal cilia near Komaggas. This form is, however, distinguished from plants of the typical variety on the Kamiesberg by its flowers in the globular part-inflorescences which are all directed upwards and not spreading in all directions.

—— var. **platyphylla** (Harv.) Toelken, comb. nov. et stat. nov.
*C. platyphylla* Harv. in Fl. Cap. **2:** 363 (1862). Type: South Africa, *Drège 6986* (S, holo!; G!).

The var. *platyphylla* is distinguished from the var. *nudicaulis* by its short broadly oblong leaves with subdistant marginal cilia and it has usually more than 24 ovules per carpel.

**35. Crassula obovata** Haw. var. **dregeana** (Harv.) Toelken, comb. nov. et stat. nov.
*C. dregeana* Harv., Fl. Cap. **2:** 346 (1862); Schonl. in Trans. Roy. Soc. S. Afr. **17:** 223 (1929). Type: Natal, between Omsamculo and Omcomas, *Drège s.n.* (S, lecto!; BM!; G!; K!; LU!; P!; SAM!; TCD!).

The leaves of plants of this variety are almost terete and their recurved marginal cilia are adpressed so that they are indistinguishable from the other hairs that cover the leaves.

36. **Crassula pageae** Toelken, nom. nov.
*Pagella archeri* Schonl. in Ann. Bolus Herb. **3:** 67, t. 3A (1921); Berger in Pflanzenfam. ed. 2, **18a:** 400 (1930). Type: Cape, near Montagu Bath, *Page* in BOL *16 645* (GRA, holo!; BOL!; PRE!).

The genus *Pagella* was distinguished from *Crassula* by its fused carpels which are half sunk into the swollen stem, but a similar phenomenon, although less far-reaching, can be observed in for instance *C. hirsuta* and *C. glomerata. C. umbellata* and *C. dodii* which often grow together with *C. pageae* produce stunted forms where the internodes also do not elongate. *Pagella archeri* is thus included in the genus *Crassula* but the name cannot be transferred because of *C. archeri* Compton.

37. **Crassula pellucida** L. subsp. **pellucida**
*C. pellucida* L., Sp. Pl. ed. 1: 283 (1753); DC., Prodr. **3:** 386 (1828); Schonl. in Trans. Roy. Soc. S. Afr. **17:** 193 (1929); Tölken in J. S. Afr. Bot. **38:** 71 (1972). Iconotype: Dillenius, Hort. Elth. t. 100, fig. 119.

The subspecies of this species complex are all geographically isolated except the subsp. *alsinoides* which occurs in forested areas, while the other subspecies are often found in the more open vegetation nearby.

1 Leaf sheath glabrous:
    2 Leaves ovate and abruptly constricted at the base and more or less fused to one another . . . . . . . . . . . . . . . **C. pellucida** subsp. **marginalis**
    *2* Leaves elliptic to elliptic-lanceolate with a cuneate to subpetiolate base:
        3 Receptacle and carpels remaining soft and membranous when fruiting; perennials with branches often longer than 20 cm long; south-western Cape as far north as the Winterhoekberge **C. pellucida** subsp. **pellucida**
        *3* Receptacle and lower parts of carpels becoming tough and spongy when fruiting; annuals with branches rarely longer than 15 cm; mountains near Niewoudtville . . . . . . . . **C. pellucida** subsp. **spongiosa**
*1* Leaf sheath more or less hairy:
    4 Internodes and pedicels glabrous; leaves abruptly constricted at the base and more or less fused to one another . . . . **C. pellucida** subsp. **marginalis**
    *4* Internodes and pedicels hairy; leaves with cuneate base:
        5 Flowers single in the axil of leaves and mainly towards the apex of stems; leaf margin regularly denticulate . . . **C. pellucida** subsp. **alsinoides**
        *5* Flowers in terminal clusters; leaf margin irregularly denticulate . . . **C. pellucida** subsp. **brachypetala**

—— subsp. **alsinoides** (Hook.f.) Toelken, comb. nov. et stat. nov.
*Tillaea alsinoides* Hook.f. in J. Linn. Soc. (Bot.) 7: 192 (1864). Syntypes: Fernando Po, *Mann s.n.* (K!); Abyssinia, near Ankobar, *Roth s.n.* (K!).
*Crassula alsinoides* (Hook.f.) Engl. in Abh. Preuss. Akad. Wiss. (1891) 231 (1892).

—— subsp. **brachypetala** (Drège ex Harv.) Toelken, comb. nov. et stat. nov.
*C. brachypetala* Drège ex Harv., Fl. Cap. **2:** 354 (1862); Drège, Zwei Pfl. Doc. 151 (1844), nom. nud. Type: Cape, between Umzimvubu & Umzimkaba Rivers, *Drège s.n.* (S, lecto!; G!; P!).
*C. lineolata* sensu Schonl. in Trans. Roy. Soc. S. Afr. **17:** 195 (1929).

—— subsp. **marginalis** (Dryand. in Ait.) Toelken, comb. nov. et stat. nov.
*C. marginalis* Dryand. in Ait., Hort. Kew ed. 1, **1:** 396 (1789); Schonl. in Trans. Roy. Soc. S. Afr. **17:** 194 (1929). Type: Caput Bonae Spei, *Masson s.n.* (BM, holo!).

—— subsp. **spongiosa** Toelken, subsp. nov. ab subsp. *pellucida* sepalis et receptaculo spongiosentibus in fructu et florescentia praecoci differt.
Herbae annuae ramis glabris decumbentibus saepe nodis radicantibus. *Folia* elliptica et plerumque apicibus terminalibus incoloratis et cuneata ad basim; vaginae foliorum glabra vel 1–3 ciliis marginalibus. *Inflorescentia* cymus terminalis saepe ramosus vel fasciculatus et partim occulata foliis subtentis, pedicellis glabris. *Sepala* circiter petala aequantia, spongiosentia in fructu. *Carpella* basibus ovariis et receptaculo spongiosentibus in fructu.

*Type:* Cape, Uitkomst, *Barker 10 739* (NBG, holo!).

Annuals with decumbent glabrous stems often rooting at the nodes. *Leaves* elliptic and usually with colourless terminal apex and cuneate base; sheath glabrous or with 1–3 marginal cilia. *Inflorescence* a terminal cyme often slightly branched or densely clustered and partly hidden by the leaves subtending it, with glabrous pedicels. *Sepals* about as long as petals and becoming spongy after flowering. *Carpels* with lower parts of ovaries and the receptacle becoming spongy when mature.
CAPE—3119 (Calvinia): between Nieuwoudtville and Oorlogkloof (-AC), *van Breda 1406* (PRE); top of Vanrhyn's Pass (-AC), *Barker 9422* (NBG); Uitkomst (-AC), *Barker 10 739* (BOL).

38. **Crassula perofliata** L. var. **perfoliata.** Toelken in J. S. Afr. Bot. **38:** 72 (1972).

As indicated earlier (Tölken, 1972) the varieties of this species complex overlap somewhat geographically except in the case of the var. *heterotricha* which has been found near plants of the var. *falcata*, but they have never been found at the same locality. However, the Transkei is botanically little known.

The var. *heterotricha* flowers in June and July while the var. *falcata* flowers like all the other varieties of this species during the period of December to March. The var. *falcata*, which has previously been combined with the var. *miniata* (Tölken, 1972), can be distinguished from that variety by its obtuse bracts in addition to its usually falcate leaves.

—— var. **falcata** (Wendl.) Toelken, comb. nov. et stat. nov.
*C. falcata* Wendl., Bot. Beobacht. 44 (1798); Willd., Enum. 341 (1809); Harv., Fl. Cap. **2:** 338 (1862); Schonl. in Trans. Roy. Soc. S. Afr. **17:** 225 (1929). Type: Cape of Good Hope, *Wendland* in Herb. Willdenow *6277* (B, lecto!).

—— var. **heterotricha** (Schinz) Toelken, comb. nov. et stat. nov.
*C. heterotricha* Schinz in Bull. Herb. Boiss. ser. 1, **2:** 203 (1894). Type: Natal, Inschanga, *Rehmann 7892* (Z, lecto!).

39. **Crassula pubescens** Thunb. subsp. **radicans** (Haw.) Toelken, comb. nov. et stat. nov.
*Globulea radicans* Haw. in Phil. Mag. **66:** 27 (1827); Eckl. & Zeyh., Enum. 301 (1837). Type: Cape, near Grahamstown, *MacOwan 836* (GRA, neo!; SAM!).
*Crassula radicans* (Haw.) Dietr., Syn. Pl. **2:** 1031 (1840); Harv. Fl. Cap. **2:** 363 (1862); Schonl. in Trans. Roy. Soc. S. Afr. **17:** 271 (1929).

The subsp. *radicans* is distinguished from the other two subspecies by its glabrous leaves and the frequent presence of adventitious roots on the lateral branches. The leaves of the subsp. *rattrayi* are denticulate and this subspecies is also distinguished from the subsp. *pubescens* by its almost spherical petal appendage which is about twice as long as broad in the latter subspecies.

—— subsp. **rattrayi** (Schonl. & Bak.f.) Toelken, comb. nov. et stat. nov.
*C. rattrayi* Schonl. & Bak.f. in J. Bot., Lond. **40:** 290 (1902); Schonl. in Trans. Roy. Soc. S. Afr. **17:** 277 (1929). Type: Cape, Graaff Reinet, *Rattray 30* (GRA, holo!).

40. **Crassula rupestris** Thunb. subsp. **commutata** (Friedr.) Toelken, comb. nov. et stat. nov.
*C. commutata* Friedr. in Mitt. Bot. Staatssamml. München **6:** 623, fig. la-k (1967) et in Prodr. Fl. S. W. Afr. **52:** 26 (1968). Type: South West Africa, Kahanstal, *Merxmüller & Giess 3499* (M, holo).

The very narrow leaves usually distinguish the subsp. *commutata* from the typical subspecies while in plants of the subsp. *marierana* the pairs of leaves are fused more than half their length. The subsp. *commutata* is geographically isolated and the subsp. *marnierana* ecologically isolated from the typical subspecies which is the most widespread of them.

—— subsp. **marnierana** (Huber & Jacobsen) Toelken, comb. nov. et stat. nov.
*C. marnierana* Huber & Jacobsen in Cactus **31,** suppl. 8 (1952). Type: Cape, Touwsberg, *Esterhuysen 25 949* (BOL, neo!).

41. **Crassula sarcocaulis** Eckl. & Zeyh. subsp. **rupicola** Toelken, subsp. nov. ab subsp. *sarcocauli* foliis lineari-lanceolatis et subulatis, fere teretibus differt.
*C. sarcocaulis* sensu Schonl. in Trans. Roy. Soc. S. Afr. **17:** 214 (1929), non Eckl. & Zeyh.
Plantae erectae et expansae rare decumbentes, ramis principalibus carnosis 0,5–3 (–5) cm in diametro et cortice cadenti frustro. *Folia* lineari-lanceolata et subulata, 0,8–2 cm longa, usque ad 0,15 cm lata, plerumque fere teretia. *Sepala* 1,5–2 mm longa.

*Type:* Natal, Cathedral Peak Forest Reserve, *Killick 1371* (BOL, holo!; NH!; PRE!).

Plants erect and spreading rarely decumbent and much branched forming a dense shrub with carnose main branches 0,5–3 (–5) cm in diameter and with peeling bark (rarely somewhat flaking bark on young stems). *Leaves* linear lanceolate, broadest at the base, 0,8–2 cm long, up to 0,15 cm broad, usually almost terete. *Sepals* 1,5–2 mm long or about half as long as the petals.

A re-evalutation of the type specimen of *C. sarcocaulis* made it necessary to describe the subsp. *rupicola* for the taxon that is known under that species name.

This subspecies is widespread throughout the Drakensberg mountains and a second population of its occurs in the high mountains of the Mlanje district of Malawi.

42. **Crassula sarmentosa** Harv. var. **integrifolia** *Toelken*, var. nov. ab *sarmentosa* foliis semper petiolaribus et integris differt.
Folium petiolo 0,3–1,5 cm longo, lamina elliptica in omnes partes plantae, margine integre et hydathodis serialis secus marginem in pagina abaxiale. *Inflorescentia* floribus rectis et vix patentibus.

*Type:* Natal, Izotscha ravine, *Strey 7630* (NH, holo!; PRE!).

Leaves with a petiole 0,3–1,5 cm long, with lamina elliptic on the whole plant, with margin entire or almost so and with hydathodes in a single row on the margin on the undersurface. *Inflorescence* with flowers usually hardly spreading and erect.
NATAL—2930 (Pietermaritzburg): Inanda (-DB), *Wood 597* (SAM).
—2931 (Stanger): Umhloti rocks (-CA), *Wood 597* (NH).
—3030 (Port Shepstone): Ixopo (-AA), *Acocks 13 781* (PRE); Paddock (-CA), *Strey 5895* (NH, PRE); Izotscha Ravine (-CB), *Strey 7630* (NH, PRE).

43. **Crassula schimperi** Fischer & C. A. Mey. var. **schimperi**
*C. schimperi* Fischer & C. A. Mey., Ind. Sem. Petropol. **8:** 56 (1841). Type: Abyssinia, *Schimper 183* (ex hort. Petropol.) (K!).
*Combesia schimperi* (Fischer & C. A. Mey.) Schweinf., Beitr. Fl. Aethiop. 80 (1867).
*Tillaea pentandra* Royle ex Edgew. in Trans. Linn. Soc. **20:** 50 (1846); Britten in Fl. Trop. Afr. **2:** 384 (1871), partly. Type: India, Himalaya mountains, *Royle s.n.* (K, holo!).
*Crassula pentandra* (Royle ex Edgew.) Schonl. in Pflanzenfam. ed. 1, 3, **2a:** 37 (1890).
*Sedum transvaalense* Kuntze, Rev. Gen. 3, **2:** 85 (1898). Type: Transvaal, Johannesburg, *Kuntze s.n.* (NY, holo!).
*Crassula transvaalensis* (Kuntze) K. Schum. in Just's Jahresb. 26, **1:** 347 (1900); Schonl. in Trans. Roy. Soc. S. Afr. **17:** 188 (1929); Friedr. in Prodr. F. S. W. Afr. **52:** 36 (1968).

The var. *lanceolata* is distinguished from the var. *schimperi* by the leaves which are all of equal length.

—— var. **lanceolata** (Eckl. & Zeyh.) Toelken, comb. nov. et stat. nov.
*Tetraphyle lanceolata* Eckl. & Zeyh., Enum. 294 (1837). Type: Cape, Krakakamma, *Ecklon & Zeyher 1874* (S!).

*Crassula lanceolata* (Eckl. & Zeyh.) Endl. ex Walp., Repert. **2:** 254 (1843).
*Crassula filamentosa* Schonl. in Ann. Bolus Herb. **2:** 63, plate 5, fig. 16 (1917) et in Trans. Roy. Soc. S. Afr. **17:** 188 (1929). Type: Cape, Majuba, *Hepburn 150* (GRA, holo!).

44. **Crassula sebaeoides** (Eckl. & Zeyh.) Toelken, comb. nov.
*Grammanthes sebaeoides* Eckl. & Zeyh., Enum. 303 (1837). Type: Cape, near Tulbagh, *Ecklon & Zeyher 1935* (K!; S!).
*Grammanthes gentianoides* (Lam.) DC. var. *sebaeoides* (Eckl. & Zeyh.) Harv., Fl. Cap. **2:** 331 (1862).
*Dinacria sebaeoides* (Eckl. & Zeyh.) Schonl. in Bull. Herb. Boiss. ser. 1, **5:** 859 (1897).

It was pointed out earlier under *C. grammanthoides* that the genus *Dinacria* cannot be separated from the genus *Crassula.*

45. **Crassula sediflora** (Eckl. & Zeyh.) Endl. ex Walp. var. **amatolica** (Schonl.) Toelken, comb. nov. et stat. nov.
*C. amatolica* Schonl. in Trans. Roy. Soc. S. Afr. **17:** 240 (1929). Type: Cape, Cata Ridge, *Dyer 356* (GRA, holo!; K!; LU!; PRE!).

The leaves of this variety are shorter (0,4–0,8 cm long) and broader (0,2–0,4 cm) and with a distinct row of marginal cilia.

46. **Crassula sericea** Schonl. var. **hottentotta** (Marl. & Schonl.) Toelken, comb. nov. et stat. nov.
*C. hottentotta* Marl. & Schonl. in Trans. Roy. Soc. S. Afr. **17:** 256 (1929); Friedr. in Prodr. Fl. S. W. Afr. **52:** 30 (1968). Type: Cape, Richtersveld, *Marloth 12 506* (GRA, holo!).

The distribution areas of the three varieties of *C. sericea* show some overlap. In both the var. *hottentotta* and the var. *velutina* some plants with intermediate characters to those of the var. *sericea* have been found and these plants were apparently not hybrids.

In their extreme forms the var. *hottentotta* is distinguished by its swollen recurved trichomes while the leaves of the other two varieties are covered with hairs. The var. *velutina* is distinguished by its acuminate petals.

—— var. **velutina** (Friedr.) Toelken, comb. nov. et stat. nov.
*C. velutina* Friedr. in Mitt. Bot. Staatssamml. München **6:** 653, fig. 8a–k (1967) et in Prodr. Fl. S. W. Afr. **52:** 36 (1968). Type: Cape, Numees, *Herre* in SUG *7978* (M, holo; PRE, iso!).

47. **Crassula setulosa** Harv. var. **deminuta** (Diels) Toelken, comb. nov. et stat. nov.
*C. deminuta* Diels in Bot. Jahrb. **39:** 467 (1907). Type: Transvaal, near Lydenburg, *Wilms 515* (B, holo†; E!; K!).

The var. *deminuta* has been recorded from only a few localities and one would need more field studies to evaluate the range of variation. This variety is distinguished from other varieties by its spike-like inflorescence and the abrupt change from the leaves to the much shorter bracts on the erect stem.

—— var. **longiciliata** Toelken, var. nov. ab varietatibus aliis ciliis marginalibus circiter 1,5 mm longis et squamis anguste oblongis differt.
Suffrutices perennes ramis ligneis usque ad 15 cm longis et foliis fasciculatis et amplectentibus circum ramos et rosulantibus in statu quieto. *Folia* elliptico-oblonga vel oblanceolata, 0,3–0,8 (-1) cm longa, 0,15–0,3 cm lata, obtusa, glabra sed ciliis marginalibus prominentibus et circiter 1,5 mm longa, dorso-ventraliter depressa et fere membranacea sed plerumque tenacia; vaginae foliorum 0,1–0,2 cm longa. *Inflorescentia* thyrsus floribus multibus. *Sepala* triangularia, glabra, acuta. *Petala* oblongo-oblanceolata, obtusa et appendicibus dorsalibus indistinctis, laevia. *Antherae* 0,3–0,5 mm longae, flavae. *Squamae* oblongo-cuneatae et plerumque breves 3plo longioribus. *Carpella* ovariis reniformibus stylis brevibus.

*Type:* Transvaal, Mount Anderson, *Galpin 13 622* (BOL, holo!; PRE!).

Perennials with woody branches up to 15 cm long, with leaves clustered and clasping around the stems and forming a rosette-like bud only in the resting period. *Leaves* elliptic-oblong to oblanceolate, 0,3–0,8 (–1) cm long, 0,15–0,3 cm broad, obtuse, glabrous but with prominent marginal cilia about 1,5 mm long, dorsiventrally flattened and almost membranous but usually tough, hardly spreading even on the erect stem; sheath 0,1–0,2 cm long. *Inflorescence* an almost flat-topped thyrse with many flowers. *Sepals* triangular, glabrous acute. *Petals* oblong-oblanceolate, with rounded apices and indistinct dorsal appendages, smooth. *Anthers* 0,3–0,5 mm long, yellow. *Squamae* oblong-cuneate and usually at least three times longer than broad. *Carpels* with reniform ovaries with short styles about a quarter the length of the ovaries.

Occurs mainly in the north-eastern Drakensberg but also in the mountains near Lydenburg.

TRANSVAAL—2530 (Lydenburg): Mount Anderson (-BA), *Galpin 13 622* (BOL, PRE).

NATAL—2828 (Bethlehem): Royal National Park (-DD), *Trauseld 201* (PRE); *Schelpe 1405* (NH).

—2829 (Harrismith): Injasuti (-AB), *Esterhuysen 20 261* (BOL); Cathedral Peak (-CC), *Killick 1487* (PRE).

LESOTHO—2828 (Bethlehem): Tsehlanyane valley (-BD), *Jacot Guillarmod 3981* (PRE); *4058* (PRE, RUH).

48. **Crassula southii** Schonl. subsp. **sphaerocephala** Toelken, subsp. nov. ab subsp. *southio* habitate decumbente et foliis angustis differt.

Suffrutices annui vel perennes ramis decumbentibus sinuosis et usque ad 15 cm longi. *Folia* anguste triangularis, 0,1–0,2 cm lata. *Squamae* quadratae vel transverse oblongae, 0,4 (–0,5) × 0,3–0,6 mm.

*Type:* Cape, Nquawakwe, *Bolus 8906* (BOL, holo!; GRA!).

Annuals or perennials with decumbent usually sinuous branches rarely longer than 15 cm. *Leaves* narrowly triangular, 0,1–0,2 cm broad. *Squamae* square to transversely oblong, 0,4 (–0,5) × 0,3–0,6 mm.

The subsp. *southii* occurs mainly along the lower Fish River, and the subsp. *sphaerocephala* has been recorded from near King William's Town to southern Natal.

NATAL—3030 (Port Shepstone): Izingolweni (-CA), *Ward 187* (PRE); Umtamvuma River (-CD), *Nicholson 1040* (NH, PRE).

CAPE—3127 (Lady Frere): Engcobo mountains (-DB), *Flanagan 2770* (PRE).

—3227 (Stutterheim): near Keiskammahoek (-CA), *Sim 1771* (PRE); *Story 3393* (PRE).

—3228 (Butterworth): Nquawakwe (-AA), *Bolus 8906* (BOL, GRA).

49. **Crassula subaphylla** (Eckl. & Zeyh.) Harv. var. **subaphylla**

*Crassula subaphylla* (Eckl. & Zeyh.) Harv. in Fl. Cap. **2:** 362 (1862); Schonl. in Trans. Roy. Soc. S. Afr. **17:** 264 (1929). Type: Cape, near Gouritz River, *Ecklon & Zeyher 1916* (S!; SAM!).

*Sphaeritis subaphylla* Eckl. & Zeyh., Enum. 300 (1837); Dietr., Syn. Pl. **2:** 1034 (1840).

*Sphaeritis incana* Eckl. & Zeyh., Enum. 300 (1837). Type: Cape, between Beaufort and Graaff Reinet, *Ecklon & Zeyher 1917* (S!).

*Crassula incana* (Eckl. & Zeyh.) Harv. in Fl. Cap. **2:** 359 (1862); Schonl. in Trans. Roy. Soc. S. Afr. **17:** 264 (1929).

*C. incana* is an extreme form of *C. subaphylla* and which is linked by a cline to plants from the eastern Cape. Although the two names were published at the same time, *C. subaphylla* is preferred, because it represents the more widespread taxon.

The var. *virgata* is more than a glabrous form of C. *subaphylla* as it usually occurs on hard gravelly slopes while the typical variety is found on sandy soils in depressions or along rivers. However, in contrast to the subspecies in the *C. tetragona* complex these two varieties are more tolerant and often grow next to one another.

—— var. **virgata** (Harv.) Toelken, comb. nov. et stat. nov.

*C. virgata* Harv., Fl. Cap. **2:** 360 (1862); Schonl. in Trans. Roy. Soc. S. Afr.

**17:** 264 (1929). Type: Cape, Pikenier's Kloof, *Zeyher 664* (S, lecto!; G!; K!; P!; SAM!).

50. **Crassula subulata** L. var. **fastigiata** (Schonl.) Toelken, comb. nov. et stat. nov.

*C. fastigiata* Schonl. in Trans. Roy. Soc. S. Afr. **17:** 261 (1929). Type: Cape, Melkhoutfontein, *Muir 3380* (GRA, holo!; PRE!). b

The internodes are completely hairy in this variety which occurs on coastal dunes between Riversdale and Humansdorp.

—— var. **hispida** (Schonl. & Bak.f.) Toelken, comb, nov. et stat. nov.

*C. hispida* Schonl. & Bak.f. in J. Bot. **36:** 368 (1898); Schonl. in Trans. Roy. Soc. S. Afr. **17:** 262 (1929), nom. illeg., non Haw. Type: Cape, Montague Bath, *Bolus 6704* (BOL, holo!; GRA!; K!; NBG!).

This variety with hairy leaves is only known from the type collection.

51. **Crassula tetragona** L. subsp. **tetragona**

*C. tetragona* L., Pl. ed. 1, 283 (1753); Sp. Pl. ed. 2: 404 (1762); Tölken in J. S. Afr. Bot. **38:** 78 (1972). Type: Caput Bonae Spei, sine leg. in LINN *400.6* (holo!).

The subspecies of this species complex often occur near to one another but remain in contrast to the varieties of *C. perfoliata* restricted to their own ecological niche.

1 Bracts without flowers on peduncle 2 or 3 pairs, if less than inflorescence irregularly branched or a flat-topped dichasium:
    2 Leaf sheath 0,05 (–0,1) cm long; stems decumbent, rooting . . . . . . . . **C. tetragona** subsp. **acutifolia**
    *2* Leaf sheath (0,15–) 0,2 cm long; stems erect not rooting:
        3 Inflorescence with flowers densely clustered; plants with stems repeatedly branching . . . . . . . . . . . **C. tetragona** subsp. **tetragona**
        *3* Inflorescence loosely branched; plant with one main branch and rarely with lateral branches . . . . . . . . **C. tetragona** subsp. **rudis**
*1* Bracts without flowers on peduncle 0, 1 pair; inflorescence a round-topped thyrse:
    4 Stems carnose with flaking bark, 0,3–1 (—1,5) cm in diameter . . . . . . . **C. tetragona** subsp. **robusta**
    *4* Stems woody with flaking bark, 0,2–0,4 (–0,6) cm in diameter . . . . . . . **C. tetragona** subsp. **lignosa**
    *4′* Stems carnose with peeling bark, 0,2–1,5 (–2) cm in diameter . . . . . . **C. tetragona** subsp. **connivens**

—— subsp. **acutifolia** (Lam.) Toelken, comb. nov. et stat. nov.

*C. acutifolia* Lam., Encycl. **2:** 175 (1783); DC., Pl. Hist. Succ. **1:** 2, t.2 (1799): Prodr. **3:** 384 (1828); Schonl. in Trans. Roy. Soc. S. Afr. **17:** 208 (1929), partly. Type: Africa, sine leg. (P–LA, holo!).

—— subsp. **connivens** (Schonl.) Toelken, comb. nov. et stat. nov.

*C. connivens* Schonl. in Rec. Albany Mus. **2:** 141 (1907) et in Trans. Roy. Soc. S. Afr. **17:** 210 (1929). Type: Cape, Matjesfontein, *Purcell s.n.* (GRA, holo!).

—— subsp. **lignescens** Toelken, subsp. nov. ab subsp. *robusta* ramis lignescentibus usque ad 0,5 cm in diametro et foliis raro longioribus 2 cm; ab subsp. *conniventi* internodis levibus et cortice confringenti et caduco differt.
Plantae erectae vel saepe ramis flaccidus, usque ad 80 cm altos, ramis lignescentibus 0,2–0,5 cm in diametro ad basim et cortice confringenti et caduco. *Folia* 1,2–2 (—2,5) cm longa, 0,2–0,3 cm lata, plerumque mutica, expansa vel erecta in ramis juvenibus; folia veteria caduca; vaginae foliorum 0,05 (—0,1) cm longae. *Inflorescentia* thyrsiformis, plerumque ramis pluribus, ut videtur pileata, saepe pedunculo brevi et uno pari bractearum vel rare absenti, bracteolis numerosis. *Petala* c. 0,2 cm longa, dorsale porcata. *Squamae* paene quadratae sed leviter constrictae ad basim, plerumque integrae. *Carpellum* 6–8 ovulis.

*Type:* Cape, Eselsfontein Pass, *Tölken 3881* (BOL, holo!).

Plants erect and often somewhat scrambling amongst other shrubs, up to 80 cm high, with main branches woody, 0,2–0,5 cm in diameter at the base and with flaking bark. *Leaves* 1,2–2 (—2,5) cm long, 0,2–0,3 cm broad, bluntly rarely sharply acute, spreading or curved upwards on young branches, with old leaves deciduous, sheath 0,05 (—0,1) cm long. *Hydathodes* scattered over the rounded lateral sides and often extending onto the lower surface of the leaves. *Inflorescence* a round-topped thyrse, usually with many branches, often with indistinct peduncle with one or no pair of bracts without flowers in their axils but usually with numerous bracts on the dichasia. *Petals* c. 0,2 cm long, dorsally ridged. *Squamae* almost square but somewhat constricted towards the base, usually truncate. *Carpels* with (6—) 8 ovules.

This subspecies is locally common from near Montagu to Grahamstown and occurs sporadically in the mountains near Springbok and Vanrhynsdorp.

—— subsp. **robusta** (Toelken) Toelken, comb. nov. et stat. nov.
*C. robusta* Toelken in J. S. Afr. Bot. **38:** 79 (1972). Type: Cape, Pluto's Vale near Grahamstown, *Tölken 4281* (BOL, holo!).

—— subsp. **rudis** (Schonl. & Bak.f.) Toelken, comb. nov. et stat. nov.
*C. rudis* Schonl. & Bak. f. in J. Bot., Lond. **1:** 283 (1902); Schonl. in Trans. Roy. Soc. S. Afr. **17:** 209 (1929). Type: Cape, Garies, *Alston s.n.* (GRA, holo!).

52. **Crassula thunbergiana** Schult. subsp. **minutiflora** (Schonl. & Bak.f.) Toelken, comb. nov. et stat. nov.
*C. minutiflora* Schonl. & Bak. f. in J. Bot., Lond. **40:** 288 (1902); Schonl. in Trans. Roy. Soc. S. Afr. **17:** 187 (1929); Friedr. in Prodr. Fl. S. W. Afr. **52:** 32 (1968). Type: Cape, Steinkopf, *Schlechter 11 496* (GRA, holo!; BM!; BOL!).

This subspecies is distinguished mainly by its somewhat elongated peduncles while the flowers of the typical variety become gradually smaller towards the north.

53. **Crassula tomentosa** Thunb. var. **interupta** (Harv.) Toelken, comb. nov. et stat. nov.
*C. interupta* Drège ex Harv., Fl. Cap. **2:** 361 (1862); Drège, Zwei Pfl. Doc. 90 (1844), nom. nud.; Schonl. in Trans. Roy. Soc. S. Afr. **17:** 267 (1929). Type: Cape, Silverfontein, *Drège s.n.* (S, lecto!; K!; P!).

This variety is distinguished from the typical one by the absence of a transition between the much longer basal leaves and the bracts on the erect stems. The squamae of the var. *interupta* are transversely oblong-cuneate.

54. **Crassula tuberella** Toelken sp. nov. ab *C. natanti* et *C. inani* rhizomate tuberellis et carpello ovulis sex differt.
Herbae ramis fastigiatis usque ad 15 cm altis et ramis paucis efferentibus rhizomate ramulis tuberellis terminalibus sphaericis usque ad 0,3 cm diametro. *Folia* linearis, 0,5–1,5 cm longa, 0,1–0,15 cm lata, obtusa, plus minusve plana supra, convexa subtus, erecta vel curva acropete, viridia; vaginae foliorum usque ad 0,1 cm longa, succulenta et adpressa. *Hydathodi* tres vel quattour seriales in marginem et una terminales. *Inflorescentia* 1 (—3) floribus axillaribus, pedicello erecto 3–6 mm longo et floribus tetrameris. *Sepala* anguste triangularia 0,8–1 mm longa, obtusa, succulenta, viridia. *Petala* ovata vel fere rhombica, 1,5–2 mm longa, obtusa et sine cristis dorsalibus, apicibus recurvis, alba. *Stamina* c. 1 mm longs, antheris atropurpuris et 0,1–0,2 mm longis, filamentis vix latescentibus ad basim et non connatis tubo petalorum. *Squamae* oblongo-cuneatae, 0,3–0,4 X 0,2–0,3 mm, truncatae, aliquantum constrictae ad basim, vix succulentae, albae vel roseae. *Carpella* ovariis paene obconicis, stylis brevissimis et stigmatibus ovarium glabrum ovulis sex fere sphericis et leviter papillosis.

*Type:* Natal, near Wakkerstroom, *Tölken 3117* (BOL, holo!).

Herbs with fastigiate erect branches up to 15 cm high, little branched and produced from an underground rhizome which has many small branches terminating in almost spherical tubers up to 0,3 cm in diameter. *Leaves* linear, 0,5–1,5 cm long, 0,1–0,15 cm broad, obtuse rarely bluntly acute, more or less flat on the upper surface, convex below, erect or often curved upwards from the middle, green; sheath up to 1 mm long, fleshy and adpressed. *Hydathodes* 3–4 in one row along the leaf margin and a terminal one below the apex. *Inflorescence* with 1 (—3) flowers in the axils of the leaves, with erect pedicels 3–6 mm long, with 4-merous flowers. *Sepals* narrowly triangular, 0,8–1 mm long, bluntly pointed, fleshy, green. *Petals* ovate to almost rhombic, 1,5–2 mm long, bluntly pointed and without dorsal ridges, recurved, white. *Stamens* about 1 mm long, with purple anthers 0,1–0,2 mm long, with filaments hardly broadened towards the base and not fused into a petal tube. *Squamae* oblong-cuneate, 0,3–0,4 × 0,2—0,3 mm, truncate, mainly constricted below the apex, slightly fleshy, white or pink.

*Carpels* with broad almost obconical ovaries and with very short styles from the inside margin of the ovaries and with terminal insignificant stigmas; ovary glabrous and with 6 ovules each almost spherical and densely covered with rows of faint papillae.

In marshy areas or shallow vleis at high altitude in the mountains between Wakkerstroom and Ermelo.

TRANSVAAL—2630 (Carolina): Lake Chrisse (-AC), *Moss 16 287* (J).

NATAL—2730 (Vreiheid): Naauwhoek (-AC), *Devenish 1005* (PRE); *Tölken 3117* (BOL).

LESOTHO—2829 (Bethlehem): Leribe (-CC), *Dieterlen 732* (NH).